REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
B	Add vendor CAGE 27014 to device 012X. Convert to military drawing format including change of drawing CAGE number. Editorial changes throughout. Inactivate device 01RX for new design.	87 NOV 20	M. A. Frye
C	Change recommended operating conditions (t_H) for V_{CC} = 6.0 V, 25°C. Change footnote 1/ in table I. Change figure 4. Inactivate device 012X for new design. Editorial changes throughout.	89 JUNE 13	M. A. Frye

CURRENT CAGE CODE 67268

REV																			
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SHEET																			

REV STATUS OF SHEETS															
REV	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	

PMIC N/A

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

PREPARED BY
Christopher A. Rauch

CHECKED BY
Ray Monnin

APPROVED BY
Michael A. Frye

DRAWING APPROVAL DATE
17 OCTOBER 1984

REVISION LEVEL
C

DEFENSE SUPPLY CENTER COLUMBUS
COLUMBUS, OHIO 43216

MICROCIRCUIT, DIGITAL, HIGH-SPEED CMOS, THREE-STATE OCTAL LATCH, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**14933**	**84072**

SHEET 1 OF 14

DESC FORM 193-1
SEP 87

5962-E1229

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

84072	01	R	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	54HC373	Octal, D-type latch with three-state outputs

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
R	D-8 (20-lead, 1.060" x .310" x .200"), dual-in-line package
S	F-9 (20-lead, .540" x .300" x .100"), flat package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings. 1/

Supply voltage range	-0.5 V dc minimum to +7.0 V dc maximum
DC input voltage range	-0.5 V dc to V_{CC} +0.5 V dc
DC output voltage range	-0.5 V dc to V_{CC} +0.5 V dc
Clamp diode current	±20 mA
DC output current (per pin)	±35 mA
DC V_{CC} or GND current (per pin)	±70 mA
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D)	500 mW 2/
Lead temperature (soldering, 10 seconds)	+260°C
Thermal resistance, junction-to-case (Θ_{JC}):	See MIL-M-38510, appendix C
Junction temperature (T_J)	+175°C

1/ Unless otherwise specified, all voltages are referenced to ground.
2/ For T_C = +100°C to +125°C, derate linearly at 12 mW/°C.

1.4 Recommended operating conditions.

Supply voltage range	+2.0 V dc minimum to +6.0 V dc maximum
Case operating temperature range (T_C)	-55°C to +125°C
Input rise or fall time:	
V_{CC} = 2.0 V	0 to 1,000 ns
V_{CC} = 4.5 V	0 to 500 ns
V_{CC} = 6.0 V	0 to 400 ns
Minimum setup time, data to enable (t_S):	
T_C = +25°C:	
V_{CC} = 2.0 V	100 ns
V_{CC} = 4.5 V	20 ns
V_{CC} = 6.0 V	17 ns
T_C = -55°C to +125°C:	
V_{CC} = 2.0 V	150 ns
V_{CC} = 4.5 V	30 ns
V_{CC} = 6.0 V	26 ns
Minimum hold time, enable to data (t_H):	
T_C = +25°C	
V_{CC} = 2.0 V	50 ns
V_{CC} = 4.5 V	10 ns
V_{CC} = 6.0 V	10 ns
T_C = -55°C to +125°C:	
V_{CC} = 2.0 V	75 ns
V_{CC} = 4.5 V	15 ns
V_{CC} = 6.0 V	13 ns
Minimum pulse width, enable (t_W):	
T_C = +25°C	
V_{CC} = 2.0 V	100 ns
V_{CC} = 4.5 V	20 ns
V_{CC} = 6.0 V	17 ns
T_C = -55°C to +125°C:	
V_{CC} = 2.0 V	150 ns
V_{CC} = 4.5 V	30 ns
V_{CC} = 6.0 V	26 ns

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Logic diagram. The logic diagram shall be as specified on figure 3.

3.2.4 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and apply over the full case operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.4 herein.

3.5 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) T_A = +125° C, minimum.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
High level output voltage	V_{OH}	$V_{IN} = V_{IH}$ minimum or V_{IL} maximum, $\lvert I_O \rvert \le 20$ µA	$V_{CC} = 2.0$ V	1,2, 3	1.9		V
			$V_{CC} = 4.5$ V		4.4		
			$V_{CC} = 6.0$ V		5.9		
		$V_{IN} = V_{IH}$ minimum or V_{IL} maximum, $\lvert I_O \rvert \le 6.0$ mA	$V_{CC} = 4.5$ V		3.7		
		$V_{IN} = V_{IH}$ minimum or V_{IL} maximum, $\lvert I_O \rvert \le 7.8$ mA	$V_{CC} = 6.0$ V		5.2		
Low level output voltage	V_{OL}	$V_{IN} = V_{IH}$ minimum or V_{IL} maximum, $\lvert I_O \rvert \le 20$ µA	$V_{CC} = 2.0$ V	123		0.1	V
			$V_{CC} = 4.5$ V			0.1	
			$V_{CC} = 6.0$ V			0.1	
		$V_{IN} = V_{IH}$ minimum or V_{IL} maximum, $\lvert I_O \rvert \le 6.0$ mA	$V_{CC} = 4.5$ V			0.4	
		$V_{IN} = V_{IH}$ minimum or V_{IL} maximum, $\lvert I_O \rvert \le 7.8$ mA	$V_{CC} = 6.0$ V			0.4	
High level input voltage 2/	V_{IH}		$V_{CC} = 2.0$ V	1,2,3	1.5		V
			$V_{CC} = 4.5$ V		3.15		
			$V_{CC} = 6.0$ V		4.2		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
Low level input voltage 2/	V_{IL}		V_{CC} = 2.0 V	1,2,3		0.3	V
			V_{CC} = 4.5 V			0.9	
			V_{CC} = 6.0 V			1.2	
Quiescent current	I_{CC}	VCC = 6.0 V, $V_{IN} = V_{CC}$ or GND		1,2,3		160	µA
Input leakage current	I_{IN}	V_{CC} = 6.0 V, $V_{IN} = V_{CC}$ or GND		1,2,3		±1	µA
Three-state output leakage current	I_{OZ}	V_{CC} = 6.0 V, $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = V_{CC}$ or GND		1,2,3		±10	µA
Input capacitance	C_{IN}	V_{IN} = 0.0 V, T_C = +25°C, See 4.3.1c		4		10	pF
Output capacitance	C_{OUT}	V_{IN} = 0.0 V, T_C = +25°C See 4.3.1c		4		20	pF
Functional tests		See 4.3.1d		7			
Propagation delay time, data to output	t_{PHL1}, t_{PLH1}	C_L = 50 pF ± 10% See figure 4 3/	V_{CC} = 2.0 V	9 10,11		175 265	ns
			V_{CC} = 4.5 V	9 10,11		35 53	
			V_{CC} = 6.0 V	9 10,11		30 45	
Propagation delay time, latch enable to any output	t_{PHL2}, t_{PLH2}		V_{CC} = 2.0 V	9 10,11		175 265	ns
			V_{CC} = 4.5 V	9 10,11		35 53	
			V_{CC} = 6.0 V	9 10,11		30 45	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ -55°C ≤ T_C ≤+125°C unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
Propagation delay time, output enable to any output	t_{PZH}, t_{PZL}	C_L = 50 pF ± 10% R_L = 1 kΩ See figure 4 3/	V_{CC} = 2.0 V	9 10,11		175 265	ns
			V_{CC} = 4.5 V	9 10,11		35 53	
			V_{CC} = 6.0 V	9 10,11		30 45	
Propagation delay time, output disable to any output	t_{PHZ}, t_{PLZ}		V_{CC} = 2.0 V	9 10,11		175 265	ns
			V_{CC} = 4.5 V	9 10,11		35 53	
			V_{CC} = 6.0 V	9 10,11		30 45	
Transition time, output rise and fall	t_{THL}, t_{TLH}	C_L = 50 pF ± 10% See figure 4 4/	V_{CC} = 2.0 V	9 10,11		60 90	ns
			V_{CC} = 4.5 V	9 10,11		12 18	
			V_{CC} = 6.0 V	9 10,11		10 15	

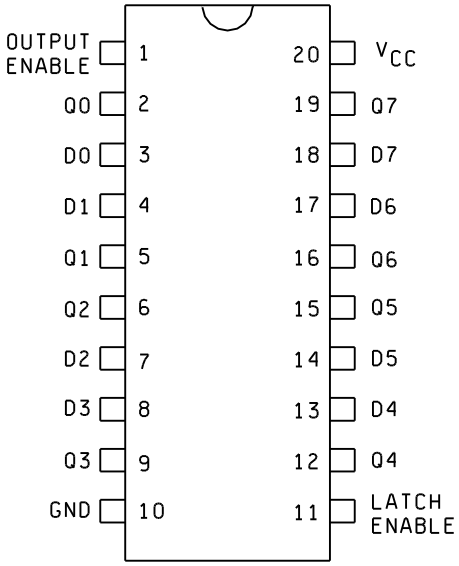
1/ For a power supply of 5 V ± 10%, the worst case output voltages (V_{OH} and V_{OL}) occur for HC at 4.5 V. Thus, the 4.5 V values should be used when designing with this supply. Worst cases V_{IH} and V_{IL} occur at V_{CC} = 5.5 V and 4.5 V, respectively. (The V_{IH} value at 5.5 V is 3.85 V.) The worst case leakage currents (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage, so the 6.0 V values should be used. Power dissipation capacitance (C_{PD}), typically 100 pF per latch, determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

2/ V_{IL} and V_{IH} tests are not required because they are used as forcing functions for V_{OH} and V_{OL}.

3/ AC testing at V_{CC} = 2.0 V and V_{CC} = 6.0 V shall be guaranteed, if not tested, to the specified limits in table I.

4/ Transition times, if not tested, shall be guaranteed to the specified limits in table I.

CASES R AND S



CASE 2

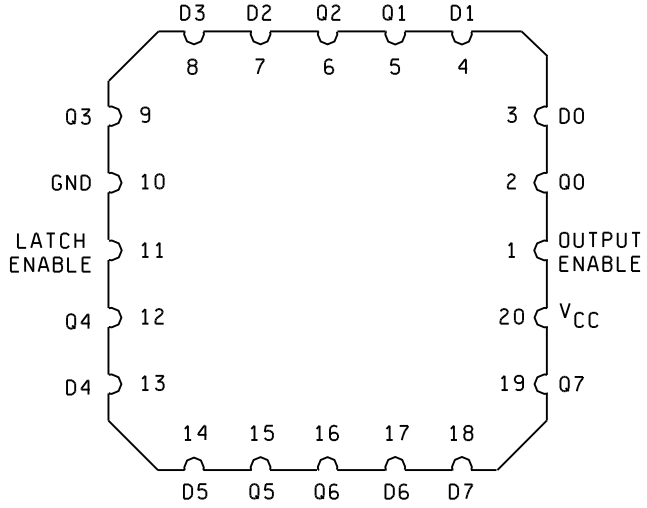


FIGURE 1. Terminal connections (top view).

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE **A**		**84072**
		REVISION LEVEL C	SHEET **8**

Output enable	Latch enable	Data	Output
L	H	H	H
L	H	L	L
L	L	X	Q_O
H	X	X	Z

H = high level, L = low level
Q_O = level of output before steady-state input conditions were established
Z = high impedance

FIGURE 2. Truth table.

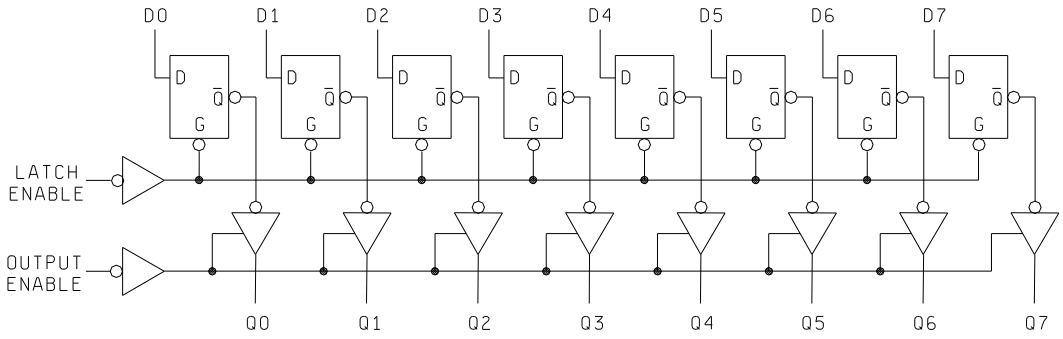


FIGURE 3. Logic diagram.

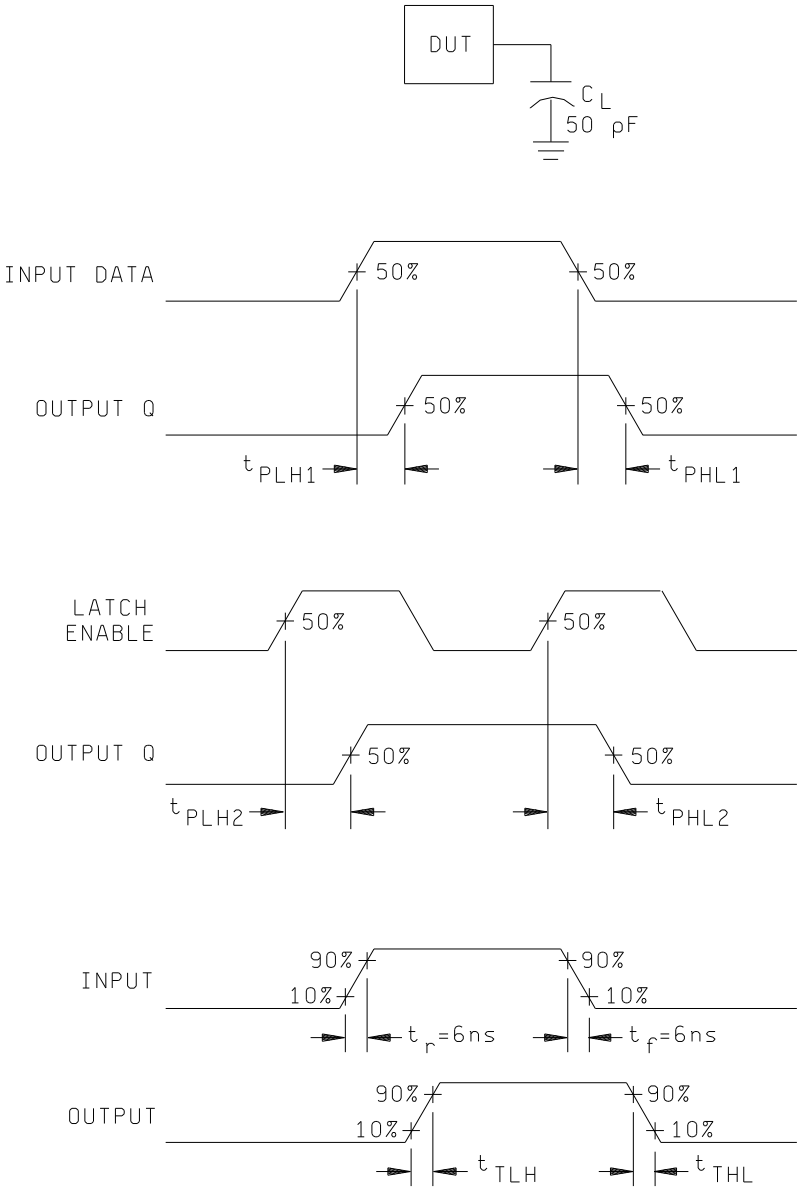


FIGURE 4. Switching waveforms and test circuits.

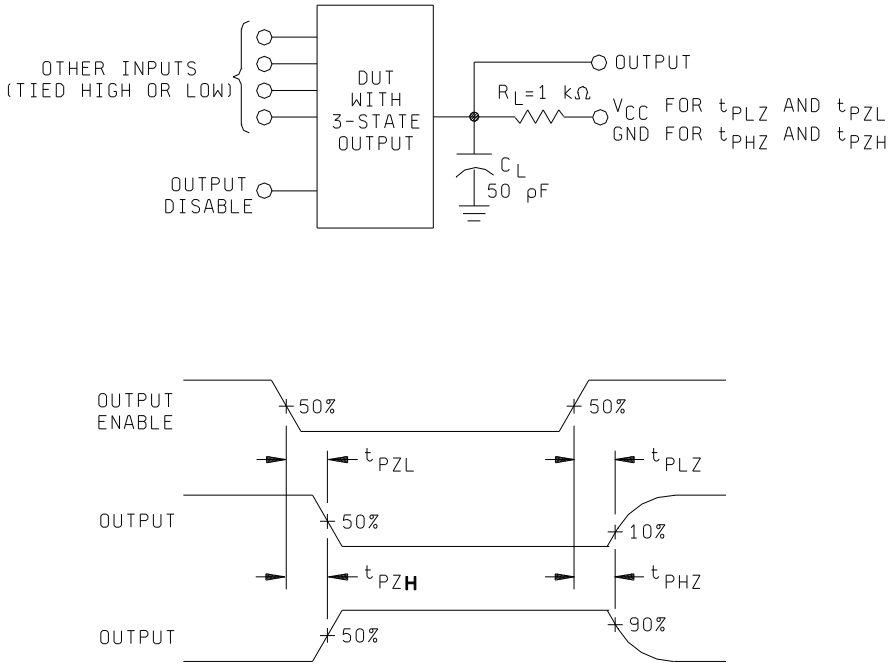


FIGURE 4. Switching waveforms and test circuits - Continued.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 5, 6, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_{IN} and C_{OUT} measurements) shall be measured only for the initial test and after process or design changes which may affect capacitance. Test all applicable pins on 5 devices with zero failures.

d. Subgroup 7 tests shall verify the truth table as specified on figure 2.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) T_A = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	----
Final electrical test parameters (method 5004)	1*, 2, 9
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 9, 10**, 11**
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

* PDA applies to subgroup 1.
** Subgroups 10 and 11, if not tested, shall be guaranteed to the limits specified in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Replaceability is determined as follows:

a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/65403B- -.

6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone (513) 296-5375.

6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/	Replacement military specification part number
8407201RX 2/	04713 27014 18714 01295	54HC373/BRAJC MM54HC373J/883 CD54HC373F/3A SNJ54HC373J	M38510/65403BRX
8407201SX	01295	SNJ54HC373W	M38510/65403BSX
84072012X 3/	04713 01295 27014	54HC373M/B2CJC SNJ54HC373FK MM54HC373E/883	M38510/65403B2X

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
2/ Inactive for new design. Use M38510/65403BRX.
3/ Inactive for new design. Use M38510/65403B2X.

Vendor CAGE number	Vendor name and address
01295	Texas Instruments, Incorporated P. O. Box 6448 Midland, TX 79701
04713	Motorola, Incorporated 7402 South Price Road Tempe, AZ 85283
18714	RCA Corporation Semiconductor Sector Route 202 P. O. Box 591 Summerville, NJ 08876-0591
27014	National Semiconductor 2900 Semiconductor Drive Santa Clara, CA 95051